spectrum. They think that the blue colour of the sky may probably be partly due to the presence of ozone.

BRAME (in *Comptes rendus*) recommends the use of baryta in place of sodium carbonate and charcoal, in the ordinary dry test for arsenic. If arsenious oxide is heated with baryta a mirror is obtained consisting partly of metallic arsenic, and partly of barium arsenate: the test does not succeed so well with arsenious sulphide.

A CONSIDERABLE deposit of crystallised (octahedral) sulphur has been found under the soil of Paris, where organic refuse matter has long accumulated. The sulphur appears to be a product of the deoxidising action of the carbon compounds present in the refuse on the calcium sulphate of the soil.

M. LOUGHININ continues, in the *Journal* of the Russian Chemical Society, his interesting researches on the quantities of heat produced by burning alcohols of the allyl series; he publishes in the *Journal* the figures corresponding to two new bodies of this series ($C_6H_{12}O$ and $C_{10}H_{20}O$), which figures, together with those he has already published in the *Comptes rendus* (vol. xci.), allow him to draw a complete table of the calories disengaged by the whole of the alcohols of this series.

THE first number of the *Gazetta Chimica Italiana* for the present year is devoted, with the exception of a paper by M. Fileti on gas analysis, to papers on organic chemistry: these include work on Camphor Derivatives by Schiff; on Picrotoxin by Paterno and Oglialoro; and on Synthesis of Aromatic Aldehydes by the use of Chromyl Dichloride, by Paterno and Scichiloni.

IN the course of a paper on the Photo-chemistry of Silver Chloride, Eder states (in *Wien. Akad. Ber.*) that this substance is more sensitive to light when substances which absorb chlorine are present, than when in the pure state. To develop the latent image he recommends especially ammonium ferrocitrate, and hydroquinone along with ammonium carbonate.

BY the action of potassium dichromate and sulphuric acid on caffeine, Hinteregger has obtained as much as 40 per cent. of dimethyl parabanic acid, and 39 per cent. of the monomethyl acid from theobromine.

IN continuation of his investigations into the action of hydrochloric acid on metallic chlorides, Ditte describes (*Compt. rend.*) several new hydrated salts which crystallise from aqueous solutions when these are saturated with hydrochloric acid. In the absence of hydrochloric acid hydrated salts with more water of crystallisation are always produced. The following table contains the principal results obtained by Ditte:—

Aqueous solution.		Solution saturated with HCl at 12°.	
Grams of salt dissolved per litre.	Crystals which form	Grams of salt dissolved per litre.	Crystals which form
700 ...	$CaCl_2.6H_2O$	270 ...	$CaCl_2.2H_2O$
500 ...	$SrCl_2.6H_2O$	20 ...	$SrCl_2.2H_2O$
720 ...	$MgCl_2.6H_2O$	65 ...	$MgCl_2.2H_2O$
415 ...	$CoCl_2.6H_2O$	205 ...	$2CoCl_2.3H_2O$ and $CoCl.H_2O$
600 ...	$NiCl_2.6H_2O$		
870 ...	$MnCl_2.4H_2O$	40 ...	$NiCl_2.H_2O$
630 ...	$CuCl_2.2H_2O$	190 ...	$MnCl_2.H_2O$
		290 ...	$CuCl_2.H_2O$

M. POUCHET describes in *Compt. rend.* a method for destroying organic matter before testing for mineral poisons in contents of a stomach, &c.; the method is based on the oxidising action of potassium-hydrogen sulphate followed by addition of sulphuric acid.

PHYSICAL NOTES

IN a little mathematical note in the *Comptes rendus* M. Thollon investigates the general equation for the passage of light through a prism, and thence deduces the proposition that for every prism there is an angle of minimum resolving power. Differentiating the general equation with respect to the index of refraction, he obtains, first, a differential equation expressing the dependence of the angular distance between two rays upon the dispersive index. A separate differentiation with respect to the angle of incidence yields a second differential equation expressing the dependence of the apparent width of the slit as seen through the prism upon the angular aperture of the slit, as viewed from the prism through the collimator. Hence a relation can be obtained between the angular distance between two rays and their apparent breadth. Further examination of the equations shows that for a certain incidence there will be a minimum of resolution (*i.e.* an incidence at which the rays are least well defined), and that for another incidence there will be a minimum of dispersion; these two incidences being symmetrically related to the angle of incidence corresponding to minimum deviation. M. Thollon states that these deductions may be readily verified by the following experiment:—A dense flint glass prism is adjusted in the position of minimum deviation for the rays D upon its supporting table in the spectroscope, lit by a sodium flame. The slit is then narrowed or widened until the two yellow rays are just in mutual contact. On then turning the prism around its axis so as to increase the angle of incidence the two rays are seen to separate and to become perfectly distinct, *the angular distance between them diminishing all the while*. But if the prism be turned in the opposite direction, so as to decrease the angle of incidence, the yellow band is seen to become wider, but without being resolved into two rays. Perhaps this research may explain why the so-called "half prism" spectroscope failed to realise all the hopes of its inventor.

RECENT observations by Hrn. Wüllner and Grotrian (*Wied. Ann.* No. 12) seem to prove that the specific volume of vapours is independent of the size of the space in which it is determined. They also confirm Herr Herwig's result, that vapours always undergo precipitation before reaching the so-called maximum tension. Further, the tension at which condensation begins is found to have a relation to the maximum tension, which depends on the nature of the liquid, but is nearly independent of the temperature. Experiments made in order to find in what measure vapour must be compressed so as to present maximum tension, gave the unexpected result, that there is in general no maximum tension in the sense hitherto accepted; but that the tension of saturated vapours, even when they are in contact with a large and excessive quantity of liquid, is perceptibly increased by compression.

THE varieties of the electric discharge in gases are fully investigated by Herr Lehmann in a recent paper (*Wied. Ann* No. 12). The chief conclusion is that there are four well-characterised modes of discharge to be distinguished, viz. glow, brush, band, and spark discharge; and these may all be obtained in air of ordinary (as well as of less) density, and also in other gases, with inserted resistances and breaks, and with sharp and rounded form of electrodes, at great or small distances. The principal characteristics are these:—1. Glow-discharge; positive glow, negative light pencil, consisting of two parts separated by a dark space. 2. Brush-discharge; positive brush, consisting of stem and branches; negative light-pencil. 3. Band-discharge; positive light with two places of intermittence, sometimes stratified, and separated from the negative glow by a dark space. 4. Spark-discharge: band of light connecting both electrodes; with two places of intermittence, brushes of metallic vapour at both ends, the positive longer, the negative thicker; sometimes oblique dark spaces.

THE influence of traction and vibrations of a metallic wire on its electric conductivity is the subject of a paper by Dr. De Marchi in the *Reale Ist. Lomb. Rend.* (vol. xiii. fasc. xix.). The results he arrives at are summed up thus: 1. Any traction of a metallic wire increases in general its resistance; when the traction is very slight however there is diminution instead of increase; with increase of traction the case comes under the general law. 2. In general the increments are proportional to the increments of traction, up to a certain limit, beyond which the variations of resistance are manifested in sudden bounds, indicating an instantaneous and profound perturbation of the molecular state of the wire. 3. The law of increments of resistance is apparently independent of that of the elongations. 4. Any vibration of a wire is accompanied by a variation of resistance generally very perceptible. In most cases there is decrease of resistance if the vibration be sonorous, and more so if harmonic; increase, if the vibration be silent. This last law however requires confirmation.

IT is known that M. Plateau distinguishes between an internal and a surface viscosity of liquids, a distinction which Signor Marangoni does not consider warranted. Herr Oberbeck (*Wied. Ann.* No. 12) has approached the question experimentally thus: A brass cross is hung bifilarly with two platinum wires by one arm; its horizontal arms carry weights whose positions can be varied by screwing, so as to vary the swing; it carries a mirror reflecting a scale, and to the lower arm is attached a thin plate

or cylinder of brass to swing in the liquid at various depths. The whole can be raised or lowered with a micrometer screw, and it is thrown into slight oscillation by means of a magnet. A rectangular glass vessel is used for the liquid. The author finds that with distilled water the resistance increases suddenly and to a quite considerable extent whenever the upper edge of the plate comes into the free surface, and he does not doubt this is due to increased friction in the surface layer. The increase of resistance from the last previous position of the plate was 60·9 per cent., and with four aqueous salt solutions there was also an increase, varying between 75·1 to 54·1 per cent. Precautions adopted to prevent the presence of foreign particles on the surface (filtration, covering with moist filter-paper, &c.) had hardly any influence on the values. Long-standing of the liquid increased the surface-resistance, and stirring then diminished it; still it was always considerable at first. With M. Plateau, Herr Oberbeck found a decrease of resistance at the surface in some liquids; this was comparatively small (alcohol 11·9 per cent., oil of turpentine 12·6, sulphide of carbon 26·3, &c.). A small addition of alcohol to water lessens its surface-resistance property in a marked degree, and with further addition the mixture behaves like pure alcohol.

In a paper on dew and fog (*Zeits. für Meteor.* Bd. xv. p. 381) Herr Dines, from observations of the former with watch-glasses exposed on different substances at night, estimates the annual dew formation to be about 35·5 mm. (on grass, 26 mm.); at the best 38 mm. The average nightly dew (in 198 observations) was hardly 0·1 mm.; in a few cases 0·3 mm.; average on grass 0·07 mm. Morning fog along a river course arises when the water is warmer than the air over it. The evaporation goes on more quickly than the vapour can be carried away; hence the latter is condensed and spreads as fog (similarly with fogs over the Gulf Stream). The evening fog on moist low-lying meadows is due to the fact that the grass surface cooled by radiation cools the lowest air-layers, so causing condensation of the aqueous vapour. The fine drops of dew, Herr Dines estimates, are about 0·001 mm. in diameter; while the finest rain-drops have a diameter of 0·3 to 0·33 mm. The particles of fog vary in diameter from 0·016 to 0·127 mm.

The colour-changes presented in the microscope by various substances (chiefly mineral) of uneven surface, when immersed successively in liquids of different refracting power, have been made by Herr Maschke (*Wied. Ann.* No. 12) the basis of a method of distinguishing substances. Such changes may be had, *e.g.* with small glass particles, observed in water, in oil of almonds, and in mixtures of the latter with oil of cassia. The dark and the bright parts of the image show different series of colours. That the effects are simply due to prismatic action of the object appears from the fact that they may be got without the microscope, by looking *e.g.* through a tube at a piece of rock-crystal in water, &c. For mineral objects Herr Maschke used five liquids; amylic alcohol and glycerine, besides the three just named. By various mixtures of these a series of liquids is obtained, giving any desired index of refraction from 1·333 to 1·606. (Coloration begins when the refraction of the liquid is near that of the object; when the former greatly exceeds the latter a certain stability of colour appears.) The method is not applicable to bodies opaque in the microscope, or having too strong colours of their own; nor yet to bodies having a greater index of refraction than oil of cassia. It may, too, prove difficult sometimes to find a liquid sufficiently indifferent to the object. Herr Maschke indicates how the refractive indices of substances may be compared by his method, and (a more difficult task) numerically determined. He also gives a number of his own determinations.

An interesting study, by Herr Holtz, of the electric discharge in insulating liquids appears in *Wiedemann's Annalen*, No. 12. Among other results the length of spark is found hardly at all dependent on quantity or on retardation of the discharge. Naturally it differs in different liquids, but only in one liquid (sulphuric ether) did it increase with velocity of rotation of the disk (this appears to be due rather to the mode of preparation than to the nature of the liquid). As in air, with dissimilar electrodes, the spark-length is conditioned by the polarity of the electrodes. The thickness, sound, and luminous force of the spark depend chiefly on the electric quantity and the retardation. The spark is thinner than in air, but brighter (brightest in sulphide of carbon, least bright in olive-oil and ether). It is more crooked than in air. Throughout its length it shows innumerable very small dark spaces. With large striking distance it appears within a largely-branching brush. (The appearances of the brush discharge, got best in petroleum, are also described.)

From data obtained in various parts of Germany, Austria, and Switzerland (*Wied. Ann.* No. 12), Herr Holtz finds a well-marked increase in risk from lightning in these parts since 1854, while no such increase appears in the number of thunderstorms. Hence he infers the causes to be telluric, and he suggests as probable causes the clearing of forests and increase of railways (attracting storms more to towns and villages); further, the increased use of metal in buildings.

Prof. Bombini has lately communicated to the Bologna Academy an interesting paper on spherohedry in crystallisation (*Riv. Sci. Ind.* No. 21), by which he means any known manner of production of a fibrous-radiate structure. From a survey of facts he concludes that the great phenomenon of crystallisation comprises two different orders of attractive energy. In the first there is simple centralised attraction, with concurrence of the elements attracted to a common centre. In the second there is attraction with directive polarity according to certain axes of symmetry, and concurrence of the attracted elements towards nodal points in a certain reticular system. Between these two kinds of crystallogenic action there are many gradations, or rather syntheses, superpositions. Further, the correlations between the sphericity characteristic of the liquid state; the spherohedry of globosity with radiated structure; the isometry of radiate pseudocubical groups; leading from the *amorphous* state of liquids to the absolutely reticular state of the true crystals (isotropic, orthoprismatic, and clinohedric) confirm the cubicity of the first system, and at the same time point to some further significant terms in the progressive series of the physical states of inorganic matter. Prof. Bombini indicates three conditions: I. Spherohedric crystallisation; II. Polyhedric crystallisation; and III. Pseudocubic, &c., crystallisation. The third may be considered intermediate between the first and the second; the first appearing as a term of transition between the sphericity of the liquid state and the polyhedry of physical solidity.

GEOGRAPHICAL NOTES

The February *Proceedings* of the Geographical Society opens with Capt. Holdich's paper on the "Geographical Results of the Afghan Expedition"; but of more importance from a geographical point of view are Mr. Wilfred Powell's "Observations on New Britain and Neighbouring Islands." The latter is accompanied by a sketch-survey of the north-east portion of New Britain by the author, which of itself is of considerable value. A correspondence between Admiral Ryder, Naval Commander in-Chief at Portsmouth, and the Council of the Society follows, by which we learn that the latter, in declining his offer to establish certain medals, are of opinion that "the plan of granting medals to officers and seamen for independent surveys is impracticable," and further that they do not consider it their business to take any action in regard to an international congress of hydrographers.

Under the title of "Union Géographique du Nord de la France," a geographical association was formed some time ago, with its head-quarters at Douai, and branches at Amiens, Arras, Boulogne, Cambrai, Charleville, Dunkerque, Laon, Lille, St. Omer, St. Quentin, and Valenciennes. In the first part of the *Bulletin* of the Union, which has been sent to us, the list of members covers about fifty pages. The object of the association is by every means to promote the development and spread of geographical knowledge, investigating specially questio s relating to the industry, commerce, and agriculture of the region of the Nord. The *Bulletin*, a volume of some size, contains papers on the Exploration of the Sahara, Nordenksjöld's last voyage, a Project for Exploring the Wellé, the Proposed Canal between the Atlantic and the Mediterranean, and the Maritime and Commercial Statistics of Dunkerque. In the *Comptes rendus* of the meetings of the various societies are abstracts of papers on a great variety of subjects, and there are besides a geographical chronicle and a pretty full bibliography. We have no doubt the Association will do much good in the North of France.

Prof. Ujfalvy has left St. Petersburg on his return from Central Asia. The journey he made during last summer was not so successful as his preceding travels, because of a serious